

## 19. EXPERIMENTS ON CAPTIVE BABOONS. (G. A. K. M.)

*Lepidoptera Rhopalocera.*

## ACCEPTED.

*P. cardui*, *R. forestan*, *J. cebrene*, *B. severina*, *C. florella*, *T. achine* (apparently with doubt, the first specimen being rejected at sight but eaten immediately afterwards, others eaten at once).

One *P. corinnus* (taken with suspicion, pulled to pieces and thrown away, then picked up, smelt, and eaten).

## REFUSED.

*A. halali*, *A. arina* (recognized and refused untasted), *L. chrysippus* (tasted and rejected), *Protosparce convolvuli* (seized eagerly by the female, but on smelling it she regarded it with suspicion; she rubbed it about on the ground and then pulled it to pieces, smelling and rejecting each piece).

A *P. sesamus* ⊕ was pulled to pieces and rejected by the female, but the remains were eaten by the male; each subsequently ate another specimen. *B. ilithyia* refused by female but eaten by male; female ate the second one offered. *C. florella* eaten readily by both. *A. halali* rejected by female at sight, tasted and rejected by male. *L. chrysippus* tasted and rejected by male.

*Coleoptera.*

## ACCEPTED.

*Polyhirma wignia* (with doubt at first); *Peploptera anchoralis*, Jac. (rejected at first and rubbed on the ground, but eaten immediately afterwards); five *Piezia marshalli* (eaten readily); *Polyceles longicornis* and *P. equestris*; *Adoretus flavicollis*; *Graphipterus mashunus*; *Piezia selousi*; *Polyhirma boucardi* and *P. semisuturata*; *Graphipterus tibialis*; *Anomala*, n. sp.; one *Anomalopus plebeius*; *Brachyccerus brevicostatus*; *Sternocera funebris*; *Peploptera chalcophoroides*; *Peploptera zambesiana*; *Micranterus carinatus*.

## REFUSED.

*Gyanopterus smaragdinus*; *Onitis alexis*; *Epilachna dreyei*; *Anthia thoracica* (evidently recognized at once; the baboon seized and flung it on the ground, rubbing it violently, with averted head, as though to kill it); *Clinteria infuscata*; *Procongnia festiva*; *Chilomenus lunata*; *Pachnoda flaviventris*; *Onthophagus gazella*; *Mylabris palliata*; *Diacantha conifera*; *Protelia amukosa*; *Zonitis*, sp.; *Plagiolera thoracica*; *Lycus ampliatius*; *L. subtrabeatus*; *L. constrictus*; *L. rostratus*.

A *Mutilla* offered twice but evidently recognized and refused (*Polyhirma wignia* eaten immediately afterwards with scarcely any hesitation). *Eletica rufa* (with evident disgust); *Malacosoma discoidalis*, Jac.; *Prionocerus dimidiatus*; *Decotoma lunata* and *M. tennesis*; *Onitis innuus*; *Oniticellus militaris*; and *Pachnoda rufa* all refused at sight.

Four *Protetia amakosa* and four *Oxythyrea dysenterica* were refused by female at first but eaten rapidly by male. The female eventually ate one of the latter, but evidently in doubt.

The above experiments were conducted at Salisbury in December 1898.

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- Jan. 7. *Psiloptera* are all eaten readily by baboons.  
„ 28. *Byblia ilithyia* eaten by young baboon (*Papio parvulus*). A *Clythra wahlbergi* was offered to baboon, but immediately refused on being smelt (it has a very decided *Coccinella*-like odour). The Coccinellid *Epilachna dregei* was refused.  
„ 29. Offered the Longicorn, *Ceroplesis fallax*, to the baboon, which smelt it and shook his head, showing evident alarm when the insect stridulated; on my pulling off the head he took the body and pulled it to pieces, smelling each part, but would not eat it. I then offered him a large brightly-coloured Cetoniid, *Cælorrhina loricata*; its strong smell was clearly distasteful to him, so I put the insect on his hand; he was much frightened and tried to shake it off, but could not, owing to its long claws, and was thoroughly terrified by the loud buzzing it made as it finally flew off. Offered *Piezia selousi* to the baboon; I could tell by the way that he tried to snatch sharply at it that he recognized it, and when he did seize it he threw it violently on the ground, rubbing it with his hands (as is their custom with distasteful insects). I picked it up and gave it to him again; he then ate the head, took a bite out of the abdomen and threw the rest away.  
Feb. 1. Another young baboon ate two *B. severina* and two *B. mesentina* with evident relish. It then refused *Onitis alexis* at sight and would not even touch it. An example of *Anomalipus plebeius* was then taken, smelt

and thrown away, although I can detect no smell in this species, which, however, stridulates strongly by rubbing the head against the thorax.

- Feb. 14. Baboon ate one *Colias electra* and one *Byblia ilithyia*. It tasted and rejected first an *A. caldarena*, then an *L. chrysippus*, then rejected at sight several *A. arina* and *A. halabi*.
- „ 15. Gave female baboon two *Teracolus achine*, which she ate with appreciation. A *Mylothris agathina* was taken with some doubt, the head and thorax were eaten and a small part of the abdomen, the rest being thrown away; it was clearly not much appreciated. An *L. chrysippus* was tasted and refused. Then an *Acræa anemosa* was offered with under-side exposed to show the bright red and black markings; it was tasted and refused. A *Precis sesamius* ⊕ was then offered in precisely the same manner; the baboon took it, held it in her hand for a few moments and then let it fly away without attempting to smell or taste. I then cut the wings off another specimen of the same insect, and this was promptly eaten without any signs of distaste. This appears very significant. Then two *Limnas chrysippus* and one *Acræa anemosa* were refused at sight without trial; one *Neptis agatha* was tasted and neglected, and two *Belenois severina* were eaten.
- „ 18. Baboons ate with great avidity two *Anoplocnemis curripes*, a large strong-smelling Hemipteron all brown in colour. They would have nothing to do with a *Mylabris distincta* or a *M. tettensis*.
- „ 20. Baboons ate readily four *Brachycerus brevicostatus*, one *Psammodes scabratus*, one *Chlanius cylindricollis*, one *Tragiscoschema wahlbergi*, and also an imago and nymph of the very large and evil-smelling Hemipteron *Petascelis remipes*.

A *Blepisanis haroldi* which was offered to one was taken, immediately thrown down without even being smelt; on re-presentation it was smelt and tasted cautiously, found to be palatable, and eaten; there can be little doubt that it was mistaken for one of the synaposematic members of the powerful Lycoid group. A larva of *Precis sesamius* was neglected by both baboons, neither taking the slightest interest in it.

Feb. 24. Baboons ate greedily two *Anoplocnemis curvipes*. As I was taking an *Anthia massilicata* out of a box the male baboon made a snap at it and received a good dose of its powerful acid in his mouth, which made him start back in a great fright, making most comical grimaces; I then offered the beetle piecemeal to the other baboon, and it was eaten with relish except the anal portion of the abdomen, which was rejected. This is of interest in connection with the immediate recognition and violent rejection of *A. thoracica* by the female in an earlier experiment. One *Catopsilia florella* and three *Terias brigitta* were next eaten. Then two *Byblia ilithyia* were offered with the upper-side exposed, and were eaten with undoubted appreciation by the female; I then showed her a large brightly-coloured example of *Acræa rahira*, also exposing the upper-side, but she recognized it, merely taking it, pulling its head off and throwing it on the ground without even smelling it. She then ate two more *B. ilithyia*, and finally I offered her an *ilithyia* and an *Acræa axina* together, both having their wings closed and being held close to one another; she took and ate the former, but quite neglected the latter. This experiment tends to show that the general resemblance which *Byblia* bears to an

- Acræa* is not sufficiently close to deceive a baboon.
- Feb. 25. Gave baboon a *B. ilithyia*, which was eaten without hesitation, then an *Acræa halali*, which she rubbed in her hands as though preparatory to eating, but eventually threw down without even smelling it; she then ate another *B. ilithyia*.
- March 20. Gave baboons three specimens of a brightly-coloured black-and-yellow spider (*Gasterucantha ornata*). They viewed them with some distrust at first, but eventually ate them with appreciation.
- „ 22. Baboons ate one *Precis archesia* and two male *Hypolimnas misippus*, but rejected a *Mylothris agathina*. They further ate two *B. ilithyia*, three *Atella phalantha*, and one *Precis sesamus* ⊕. I then offered an *Acræa natalica*, which was seized, smelt, and thrown away; another *P. sesamus* ⊙ was offered immediately afterwards and neglected.
- „ 26. Gave baboon a *Mylothris agathina*; she regarded it with some suspicion, but eventually ate it very slowly and evidently did not care about it. I then gave her another specimen; she pulled the abdomen off, smelt at the exuding juices, and after tasting them gingerly with her tongue, threw the insect away. After this two *Belenois scervina* were eaten with relish. I then gave her a *Neptis agatha*, and she seemed to hesitate about taking it, and after tasting a portion of the abdomen neglected it. Of a second specimen she ate rather more before throwing it down; the remains I offered to the other baboon; he tasted it and seemed in doubt for some time as to whether it was fit to eat or not, but finally rejected it.
- April 9. Gave baboon a female *Hypolimnas misippus*, var. *inarius*, of which I had cut off the

- wings; she ate it readily and likewise a *P. sesamus*.
- April 22. The female baboon ate with relish a male *Hypolimnās misippus* and a *Precis sesamus* ☉. I then gave her a *B. ilithyia*, which she pulled to pieces and threw down, but then changed her mind, picked up the thorax and ate it, and immediately afterwards she ate three more examples in quick succession without hesitation. A single *B. ilithyia* given to the male was pulled to pieces and neglected.
- „ 23. A *Rhopalocampta forestan* and *R. pisistratas* were eaten with avidity by female baboon; she watched with great eagerness while I opened another box, and was evidently disappointed when I produced a *Belenois mesentina*; she ate it, however, and another after it. She seemed doubtful about a *Herpænia eriphia*, but while she was tasting it the male made a grab at it, and I could not decide whether the insect was really appreciated.
- May 1. The female baboon ate a *Papilio corinneus* without any signs of distaste, and likewise a *Belenois mesentina*. She then took a *H. eriphia*, but without eagerness, and pulled it to pieces, tasting it gingerly, and finally rejected three-parts of it. Another *B. mesentina* was then offered and neglected.
- „ 21. Offered female baboon a larva of *B. mesentina*. She was clearly afraid of it, snatching it from my hand and throwing it down, but she soon picked it up again and began examining it very cautiously; finally she decided to taste it, and after some consideration came to the conclusion that it was all right. She then eagerly devoured over twenty of them, though it was evident she did not like to feel them wriggling in her hand. I noticed that she almost always squeezed out the excreta of the caterpillars before eating
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them. The male was much too frightened to eat them in spite of the example of the female. I then gave a *B. severina* to the female and a *B. mesentina* to the male, both being eaten readily. The female made a grab at my box, seized a *Mylothris agathina* and a *B. mesentina* together and began eating them at the same time; she soon found something was wrong and dropped them, then picked up the *Mylothris*, tasted it and threw it away, eating the *Belenois* afterwards. The male, who had meantime eaten another *B. mesentina*, picked up the discarded *Mylothris*, but on tasting it also at once rejected it. Then four *Teraecolus omphale* and three *T. achine* were eaten with undoubted appreciation by both baboons. On giving each a *H. eriphia* they were both tasted and rejected; the female ate a *T. phleggyas* and neglected another *H. eriphia*.

There can be little doubt as to the distastefulness of this latter insect to a certain extent, but I should be inclined to rank it rather lower than *Mylothris* and about on a par with *Neptis agatha*.

Finally, six *Terius senegalensis* were eaten without any sign of distaste by both baboons, though the insects are too small to be much appreciated by them.

Salisbury, Sept. 21, 1900.—I could not yet say what protective character is possessed by the *Ichneumonidæ*, but with the Bracons there can be no doubt that it consists in their having a very strong and unpleasant smell, somewhat resembling that of the *Coccinellidæ*, only rather more pungent. They do not attempt to defend themselves by stinging, and their flight is slow, rendering them very conspicuous on the wing. I gave one of the common red species to my monkey (*Cercopithecus pygerythrus*) the other day. He put it straight into his mouth without smelling it, but soon spat it out again. I then offered the mangled remains to one of the baboons, but she merely smelt and rejected them. It is interesting to note that



the baboons, which eat insects largely, are much more cautious in receiving any food than is the *Cercopithecus*.

20. CONCLUSIONS FROM EXPERIMENTS ON CAPTIVE BABOONS, MUNGOOSE, AND KESTRELS. (G. A. K. M.)

[Mr. Marshall's notes on these insectivorous animals were in one series, which I have analyzed for the purpose of this memoir. Hence the following references in his letters deal with the experiments as a whole, except in those instances in which a particular animal is named.—E. B. P.]

Salisbury, June 20, 1899.—In view of the above experiments it seems to me impossible to regard such genera as *Terias*, *Teracolus*, *Belenois*, *Byblia*, etc. as unpalatable. I quite agree with your excellent suggestion that distasteful characters probably first arose in the larval stage and were transmitted to the imago, and this view lends further support to the presumed palatability of *Belenois*, for my baboon ate the larvæ with much relish. *Teracolus* likewise I must still regard as a non-distasteful genus, at least so far as the orange- and purple-tipped groups are concerned.

I was much pleased with the undoubted proof of mimicry [in the experiments with baboons] in the case of *Precis sesamius* ⊕, for I do not recollect having seen an account of direct experimental proof before.

With *Byblia* I was not so successful as I had hoped, but I am inclined to attribute the hesitation in accepting this species, which was observed in some instances, to imperfect mimicry. I fully recognize the difficulty in distinguishing in such experiments between Batesian and slightly Müllerian mimics, as either might be received with hesitation at first, though if subsequent specimens were eaten readily (as in the case of *Byblia*) I should think they must be included in the former category.

The eager acceptance of the malodorous Coreid bugs by my baboons came as a very great surprise to me, and several other results in these experiments point to the great danger of generalizing on the unpalatability or otherwise of insects, from the results of experiments on only one kind of animal.

Salisbury, April 25, 1899.—I may mention that so far as my experiments go I have no evidence for the unpalatability of *Terias*, *Teracolus*, *Belenois*, *Byblia*, *Precis*, or *Hypolimnas*, whereas *Mylothris* and *Neptis* are certainly distasteful to some extent.